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| 10/549,698 | 07/14/2006 | Masanori Sakai | 1592-0178PUS1 | 9561 |
| 2292 | 7590 | 08/06/2009 | EXAMINER | |
| BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747 | | | | CHEN, KEATH T |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/549,698 | SAKAI ET AL. | |
| | Examiner | Art Unit | |
| | KEATH T. CHEN | 1792 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 11 May 2009.

2a) This action is **FINAL**. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-12 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-12 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some * c) None of:

1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)

2) Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5) Notice of Informal Patent Application

6) Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant amendment of the claims, filed on 05/11/2009, in response to the rejection of claims 1-10 in the non-final office action mailed on 02/12/2009, by amending claims 1, 4, 5, 9, and 10 and adding new claims 11-12 is acknowledged and will be addressed below. The examiner notices that Applicants did not cite support for the amendment.

Claim Interpretation

The “at least one controller” in claim 1 is considered the controller 121 plus various valves because the “at least one controller” performs the function of “supply a first gas … alternately, supply a second gas” which is not accomplished by a single valve but the cooperation of the controller 121 and various valves. Additionally, because the physical relationship of “a first (or second) supply tube between the at least one controller and the processing chamber” it cannot be 121 alone because the program controller does not have such relationship.

Claims 1, 9, and 10 recites “a first supply tube including …an inert gas line” and “a second supply tube including an inert gas line” while it is understood that these are two different inert gas line, a second inert gas line may clarify it further.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35 U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1-9 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US 20020073923, hereafter '923), in view of Miyazaki et al. (US 5252133, hereafter '133), Seelback et al. (US 4699805, hereafter '805), and Bi et al. (US 20030228415, hereafter '415).

'923 teaches some limitations of:

Claim 1: A vertical heat treatment apparatus (Fig. 1, [0086], the claimed substrate processing apparatus) comprising: a reaction tube (#11, [0087], the claimed processing chamber) accommodates wafer boat/substrates (#14, [0088]), a heater (#16, [0089], the claimed heating member), at least one controller (#75, [0122] along with valves VB1-VB4, similar to the at least one controller in Applicants' apparatus, see claim interpretation above) that controls gas source (#35b, [0094], the claimed first gas) to the processing chamber (#11) through gas pipe (#33b, [0094], the claimed first gas supply tube) and gas source (#35a, precursor, [0093], the claimed second gas) to the processing chamber (#11) through gas pipe (#33a, [0093], the claimed second, independent, gas supply tube) (note the "alternately" supply of the first and the second gas is an intended use of the apparatus which the controller #75 is capable of), the first gas supply pipe (#33b) connects to a mass flow controller (#34b, [0094]), a valve (VB2), an inert gas line (from #36b) downstream of valve (#36b is connected downstream of VB2 as shown in Fig. 1, the claimed "the first supply tube including a first mass controller, a first valve and an inert gas line connected thereto downstream of the first valve"), the second gas supply pipe (#33a) connects to a mass flow controller (#34a, [0093]), a valve (VB1), an inert gas line (from #36a) down stream of valve (the claimed

"the second supply tube including a second mass controller, a third valve and an inert gas line connected thereto downstream of the third valve"), both gas supply tubes (#33a and #33a) are connected to gas supply member below the reaction tube heater (#16, as shown in Fig. 1, the claimed "whose temperature is lower than the decomposition temperature of said first gas or said second gas", as this is intrinsically met by selecting the gas type supplied and the heater setting).

Applicant's claim requirement "controller controlling gas supply to supply a first gas ... and, alternately, to supply a second gas to ..." is considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (*Walter*, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (*In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

'923 further teaches each gas supply tube connect to a separate gas supply member (#31a and #31b) but is silent on the details of supply of gas source #35a such as SiCl₄ ([0093]), therefore does not teach the other limitations of:

Claim 1: A) a single gas supply member which supplies said first and second gases into said processing chamber (and which has a portion extending to a region whose temperature is equal to or higher than a decomposition temperature of at least one of said two gases is intrinsic as the heater is capable be adjusted to any suitable temperature for decomposition of gas), B) (the second supply tube including ...) a reaction gas container and a second valve, the reaction gas container located between the second valve and the third valve, and C) a heater between the second mass controller and the single gas supply member.

'133 is an analogous art in the field of vertical CVD apparatus (title) particularly using gas inlet tube (title) in solving the problem of uniformity (col. 2, lines 62-65, and Fig. 7). '133 criticize the non-uniformity of using two reaction tubes (Figs. 9-10), col. 1, line 12 to col. 2, line 59) and provides a solution of a single gas supply tube (#30', col. 4, line 5) the connected two gas supplies (#221 and #222) at the bottom of the reactor (lower temperature), for the purpose of improved uniformity (See Figs. 3-6).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined '133 with '923. Specifically, by combining the individual supply tube (#31a and #31b) of '923 with a single gas supply tube (the

limitation A) of what '923 not taught), for the purpose of coating uniformity, as taught by '923 (col. 2, lines 62-65).

'805 is an analogous art in the field of CVD apparatus with stacked substrates (abstract), particularly in solving the problem of uniformity (col. 3, lines 36-38; similar to '133, col. 2, lines 62-65, and Fig. 7). '805 teaches a heater in the high molecular weight material (WF6 and TiCl4, col. 5, lines 8-10) supply line to increase flow rate (col. 5, lines 38-39).

'415 is an analogous art in the field of uniform coating on substrate (field of the invention). '415 teaches the supply of precursor liquid (e.g., SiCl₄ [0252]), in a container (#120, Fig. 6, [0123], the claimed reaction gas container) with upstream carrier gas (#122) and MFC (#146, the claimed second valve, such that the reaction gas container is located between the second valve and the third valve), for the purpose of delivering reactant ([0123]).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined '805, and '415 with '923 and '133. Specifically, to have added a heater to the precursor delivery tube (33a of '923 to supply SiCl₄ for example, corresponding to the high molecular weight material delivery tube of '805), for the purpose of increase flow rate, as taught by '805 (col. 5, lines 38-39); and to have added precursor liquid container and carrier gas and associated MFC valve, as taught

by '415, to facilitate delivery of the precursor reactant (e.g. SiCl₄), as taught by '451 ([0123]).

Claim 4 is rejected for substantially the same reason as claim 1 rejection above. Note the porous nozzle is considered as supply tube with holes, similar to Applicants' Specification (#233, Fig. 3), which is the same as '133 single gas supply tube #30').

Applicant's claim requirements "two gases which react with each other are alternately supplied ...", "(a first valve) for delivering an oxidizing agent containing oxygen from an oxidizing agent supply", "(a second mass controller) for delivering a metal organic gas from a metal organic gas supply to a gas container" of claim 4 are considered intended use in the pending apparatus claims. See discussion above.

'932 (and '133, '805 too) further teaches the limitations of:

Claim 9 (besides the limitations of claims 1 and 4): heater (#16) if formed around the reaction tube (#11, [0089], the claimed "hot wall type processing furnace ... a heating member which is disposed outside of said processing chamber and which heats said substrates").

For claim 6, '923 teaches the need of cleaning the reaction tube and exhaust and exhaust pipe ([0066]) from unwanted deposition and '133 teaches the use of separate gas supply tube pipes to avoid unwanted reaction in the single tube (col. 1, lines 54-61). A person of ordinary skill in the art would have known the need to clean the single gas

supply member in the above combination to have had the limitations of claim 6 "said controller supplies a cleaning gas ... to carry out a cleaning operation of said processing chamber and a removing operation of said film adhered to said gas supply member".

Furthermore, Applicant's claim requirements "supplies a cleaning gas" of claim 6, "trimethyl aluminum ... ozone" of claim 7, "tetrakis hafnium ... ozone" of claim 8, as to the supplied gas identities; and "controller is configured to control the gas supply to supply an inert gas through the second supply tube when supplying the first gas to the processing chamber through the first supply tube, and to supply an inert gas through the first supply tube when supplying the second gas to the processing chamber through the second supply tube" of claims 11 and 12, as to the use of the apparatus (which '923 is intrinsically capable of through controller #75's controlling of all valves VB1-VB6, [0122]) are considered intended use in the pending apparatus claims. See discussion of intended use above.

'133 further teaches the limitations of:

Claim 2: said gas supply member is a nozzle having a plurality of gas injection openings (injection holes #34, col. 4, line 22).

Claim 3: a reaction tube (tube #12, col. 1, line 16) which forms said processing chamber and which can accommodate a plurality of stacked substrates therein (#20s, col. 1, lines 26-28), wherein said nozzle extends from a lower portion to an upper portion of said reaction tube along a direction in which said substrates are stacked (as shown in Fig. 1).

Claim 5: a film produced by reaction of said first and second gases is adhered to an inner wall of said gas supply member (a film is capable of forming inside the gas supply member either by choosing the reaction gases or by setting the temperature).

3. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jallepally et al. (US 20030106490, hereafter '490) in view of '923, '133, '805, and '415.

'490 teaches the method of ALD (title) using two independent supply tubes (as shown in Fig. 7 [0056], see Fig. 1 for the whole apparatus) for an oxidizing agent ([0055], last sentence) and a metal organic gas (TAETO, for example, middle of [0055]), an inert gas line (from #38) for each of the two reactant gas lines (A and B); and the ALD comprising the first step of supplying A ([0057], first sentence, the claimed first period) and the third step of supplying B ([0058] the first sentence) while the purge gas valve remain open during reactant A and B dose ([0059], the claimed method in the last 8 lines of claim 10), for the purpose of reducing gas phase reaction between the reactants ([0044], the last three sentences) .

For substantially the same reason as in 35 USC 103 rejection of claim 1 rejection above, '923, '133, '805, and '415, together, teach an apparatus which has every limitation of the apparatus, including two supply tubes extending into the process chamber, of in the preamble of claim 10, as discussed above.

'805 does not teach the method of claim 10:

A first gas including an oxidizing agent including oxygen and a second gas including a metal organic gas, the method comprising the steps of: supplying a first one of said two gases to the single gas supply member through a first one of said two supply tubes for a first period of time while supplying an inert gas through a second one of said two supply tubes; and after said first period of time, alternately supplying a second one of said two gases to the single gas supply member through the second one of said two supply tubes for a second period of time to form a film or films on said substrate or substrates while supplying an inert gas through a second one of said two supply tubes.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have applied the process of '490 by using the combined apparatus of '923, '133, '805, and '415, as set forth in claim 1 (the rest of the claim 10) for its suitable use the process of '490. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. MPEP 2144.07.

Response to Arguments

Applicant's arguments filed 05/11/2009 have been fully considered but they are unconvincing in light of new ground of rejections above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEATH T. CHEN whose telephone number is (571)270-1870. The examiner can normally be reached on 6:30AM-3 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. T. C./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792